

# Learnt from A CFIT Accident Investigation

~ the Power of Flight Data Monitoring ~

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# Outline

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- ◆ About the Aviation Safety Council

- ◆ An ATR 72-500 CFIT Accident

  - ◆ Operator's Basic Information

  - ◆ **Synopsis**

  - ◆ FOQA and SMS investigation

- ◆ Lessons learnt

# About the Aviation Safety Council

**ASC was established in 1998 :**  
an independent safety agency

7 board members  
+  
20 investigators

Since 1998 ASC has investigated  
**125 cases** and  
issued **968 safety recommendations**



# Technical capabilities at ASC

## ASC Investigation Laboratory

**5** investigators

No. of recorders readout/analysis in 2016 :

**26** for investigative purpose

**22** for technical assistance purpose

Flight Recorders  
Readout

GPS & NVM Readout

Site Survey  
&  
Underwater Searches

Performance Analysis  
&  
Visualization

Technical Research  
& Exercise

# Operator's Basic Information



IATA  
GE

ICAO  
TNA

Callsign  
TRANSASIA

**Founded**

21 May 1951

**Ceased  
operations**

22 November 2016

**Hubs**

- Taipei Songshan Airport
- Taiwan Taoyuan International Airport
- Kaohsiung International Airport

- ◆ 10 ATR
- ◆ 10 A320
- ◆ 2 A330

Average no. of flight  
**337/month**

Average no. of ATR  
pilots **53**

# ATR 72-500 accident

## Synopsis

- ◆ ATR72-500 crash on July 23, 2014
- ◆ TransAsia Airways passenger flight from Kaohsiung to Makong, in stormy weather
- ◆ NPA to RWY 20, limits:  
VIS 1,600 m, MDA 330 ft.
- ◆ No. of fatalities: 48



# ATR 72-500 accident (ECCAIRS coding)

## Events

- An approach below minima , during Intermediate approach. {Occurrence}
  - Instrument meteorological conditions
  - Instrument approach (no instrument landing system)
  - Thunderstorm : Encountered
  - Updating of weather information by the meteorological service : Not updated
    - Air traffic controller., Human interface-air traffic control operational procedures : Not followed
    - Air traffic controller., The interface between humans in relation to communications : Inappropriate
- Unsafe descent , during Final approach. {Occurrence}
  - Minimum descent altitude (MDA) : Descended below; Not complied with
    - Flight crew., Psychological action-procedure violation : Intentional
    - Operator., The interface between humans in relation to supervision : Inappropriate
    - Government - Civil Aviation Authority/Administration, The interface between humans in relation to supervision : Inadequate
- Aeroplane - deviation from intended flight path/attitude (fixed wing aircraft) , during Final approach. {Occurrence}
  - Rain : Heavy; Increased
  - Runway visual range : Decreased
  - Crosswind : Strong
  - Aircraft performance - control parameters : Not monitored
    - Flight crew., Psychological-attention, perception and monitoring : Inappropriate
- Aircraft collision with building , during Missed approach or go-around. {Aircraft - B-22810}
  - Flight crew's obstacle clearance judgement : Inappropriate
    - Pilot., Lack of or excessive confidence problems
    - Pilot., Fatigue-chronic : Adversely affected
  - Instrument flight rules missed approach : Too late
    - Flight crew., Psychological action-procedure violation : Intentional



# ATR 72-500 accident

## Investigation highlight

- ◆ weather
- ◆ SOP non-compliance
- ◆ organizational factors

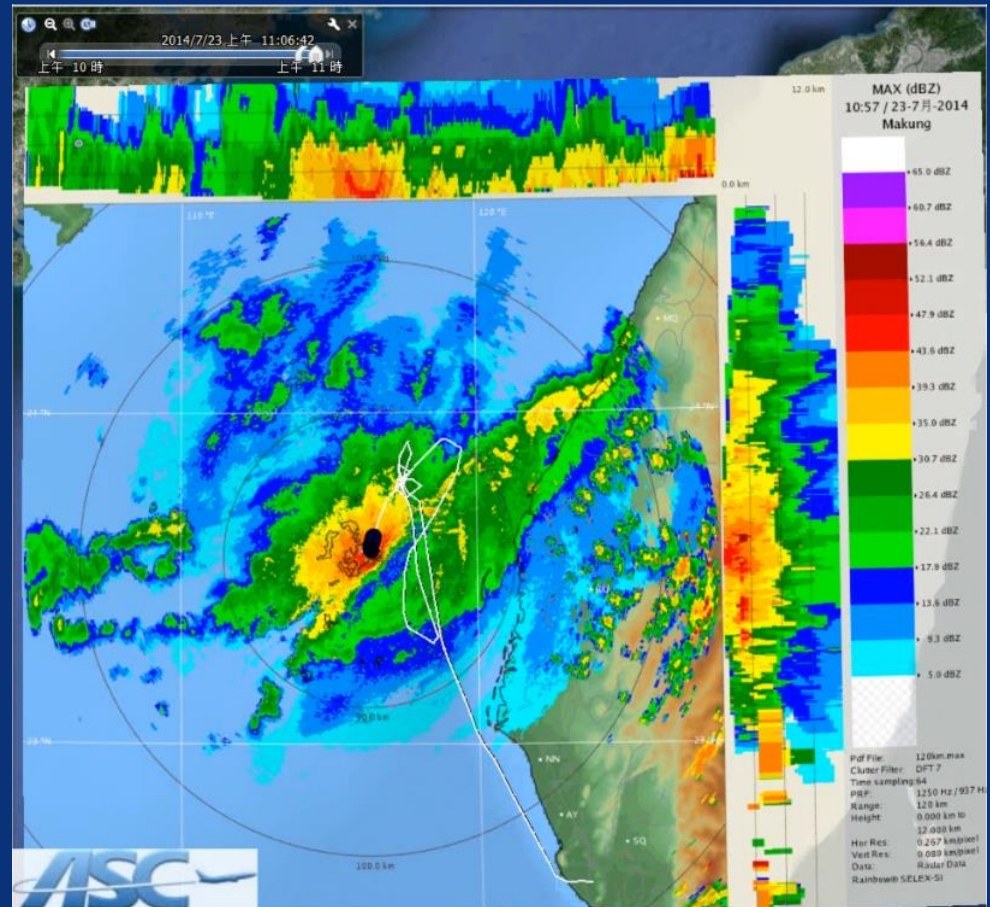
## Investigation Team

ARs: BEA, NTSB, TSB

9 group, 56 people

Factual report- 6 months

Final reports -**19 months**





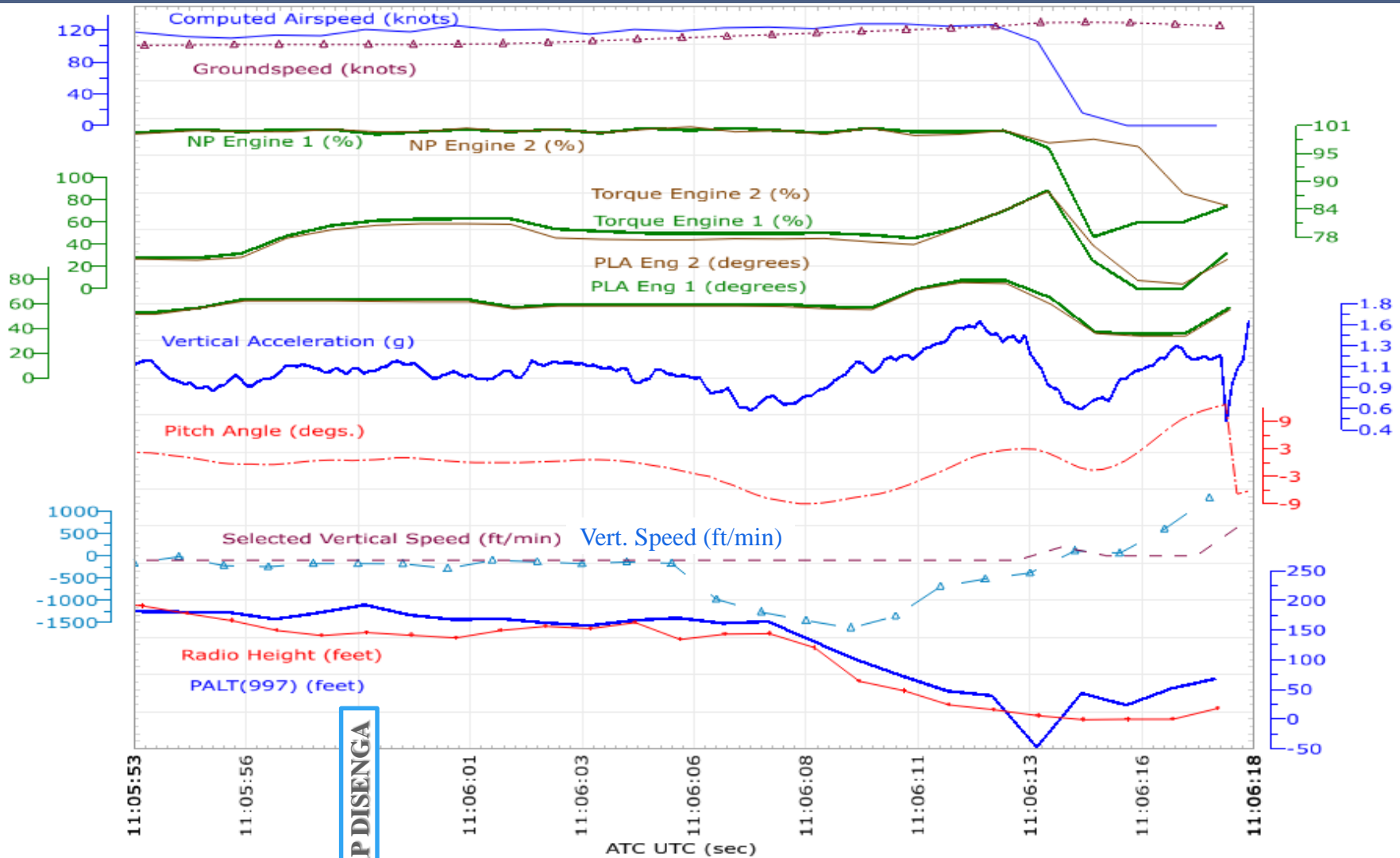
# ATR 72-500 accident



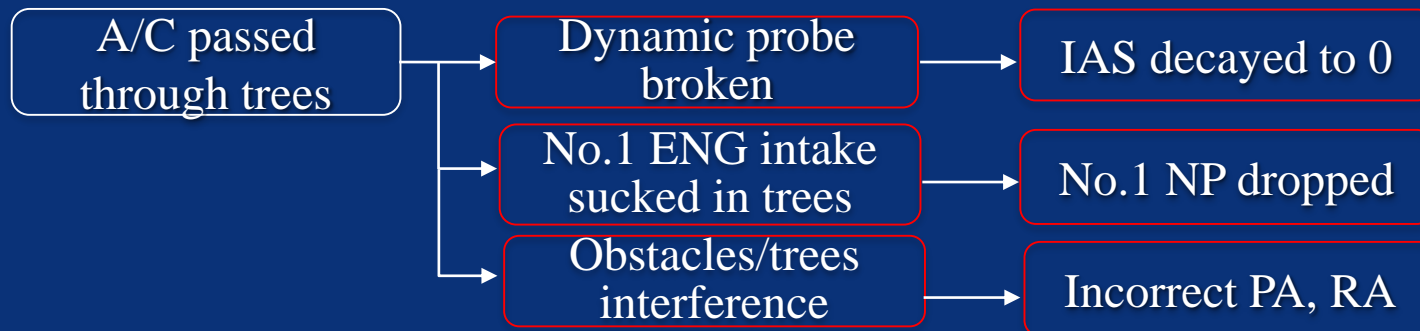
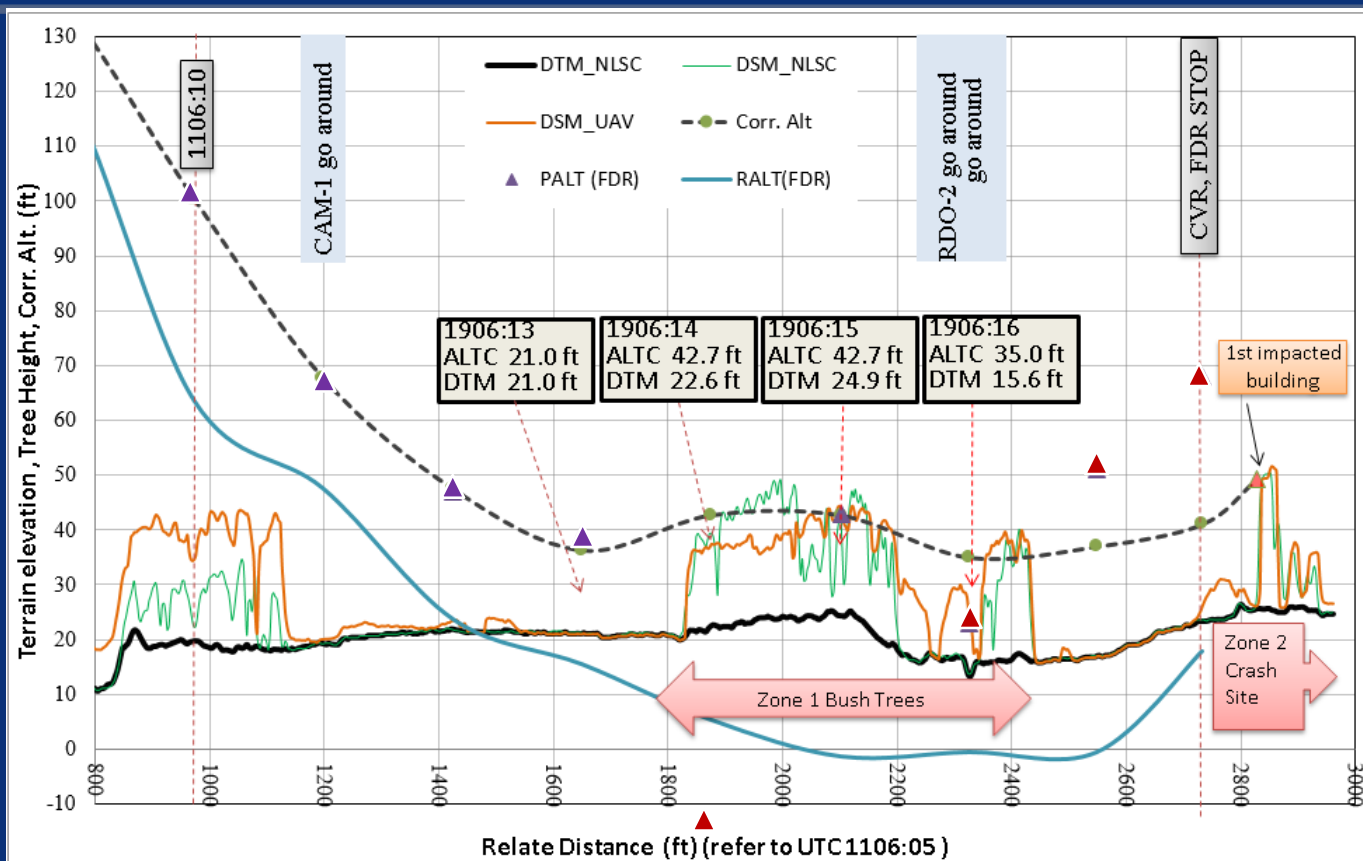
1) FDR readout and analysis

2) FOQA and SMS investigation

# 1. FDR readout and analysis

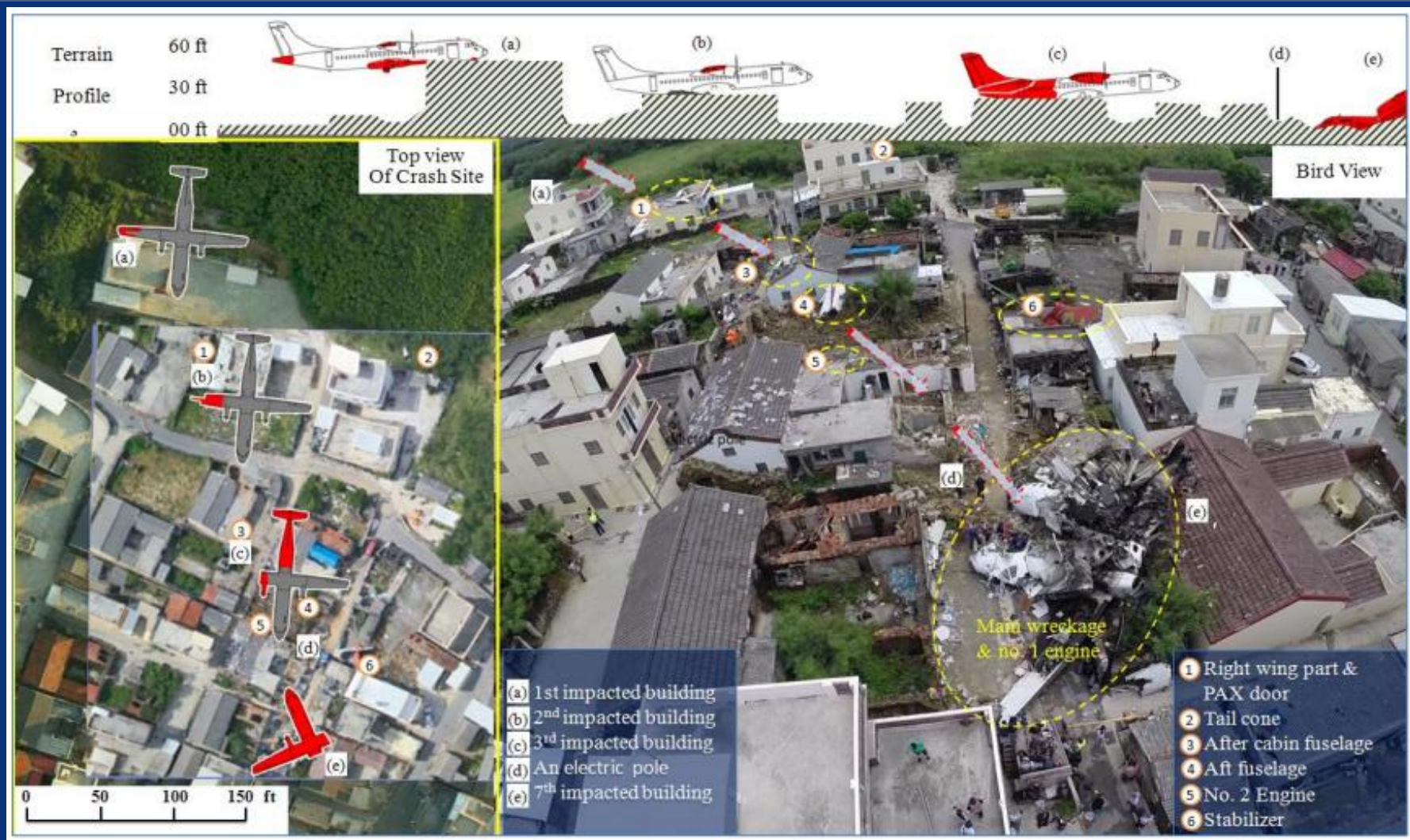


# FDR Data Correction – Alt.



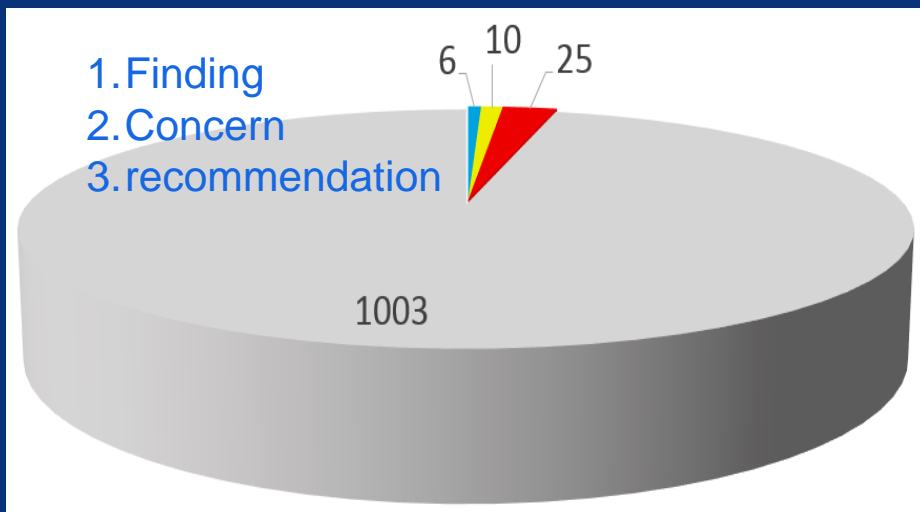


# Aerial image of occurrence site superimposed with the main wreckage and final flight trajectory



## 2. FOQA and SMS investigation

From 1 Aug. 2013 to 22 July 2014.



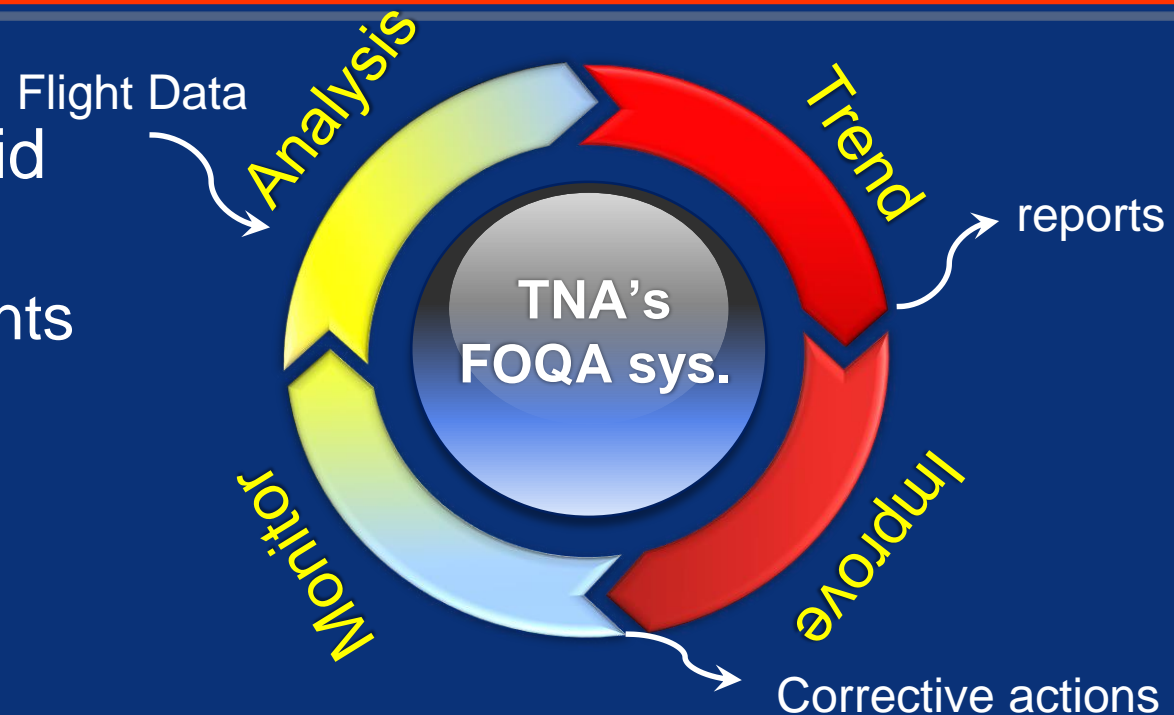
CAA conducted 1,044 inspections with no finding related to FOQA deficiency. (inspection observed with deficiency < 4%)

- ◆ About 35,100 flights, only few FOQA events were triggered.
  - ◆ 2013, 32 FOQA events (2 red, 7 amber)
  - ◆ 2014, 14 FOQA events (0 red, 1 amber)

## 2. FOQA and SMS investigation

TNA FOQA system did not monitor:

- ◆ master warning events
- ◆ stall warning events
- ◆ AFCS modes below MDA
- ◆ FOQA program contained erroneous information (i.e. DME, select VSI / VSI)



**No evidence** indicates that those FOQA events or the trend analysis results were discussed during TNA's safety meetings.



## 2. FOQA and SMS investigation

- ✓ Interviews (45)
- ✓ TNA's SMM & FOQA program,

Technical support

- ✓ AFM limitation
- ✓ Simulator Flight
- ✓ Human performance



- ✓ Interviews (30)
- ✓ Obs. Flight (20)
- ✓ Simulator Flight ( 5 days)

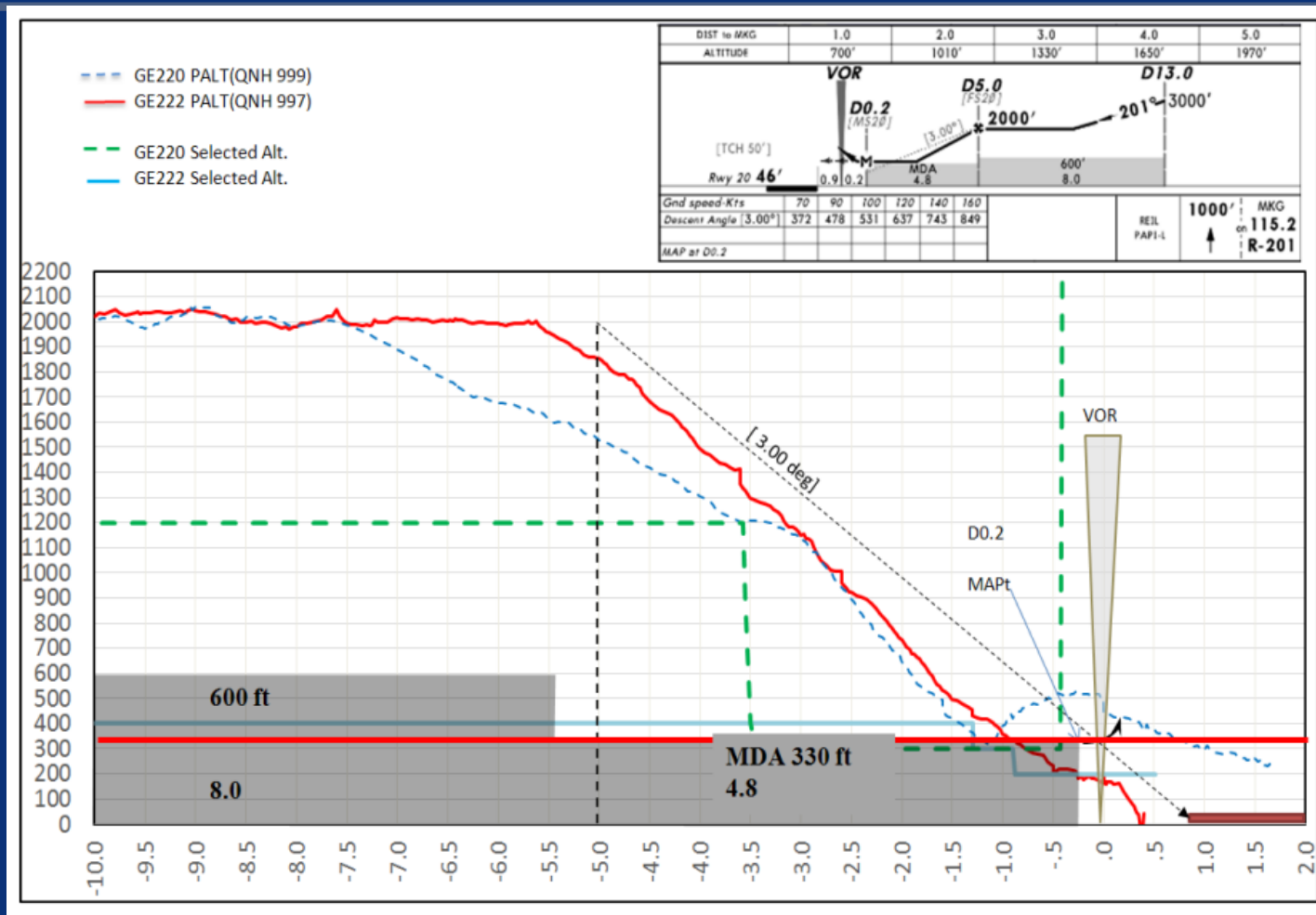
- ✓ Accident flight data
- ✓ Previous flight data
- ✓ CVR transcripts
- ✓ TNA's FOQA events (+100)

*Focus on systematic factors:*

Flightcrew Fatigue, SOP non-compliances

Operator's SMS, CAA's safety oversight

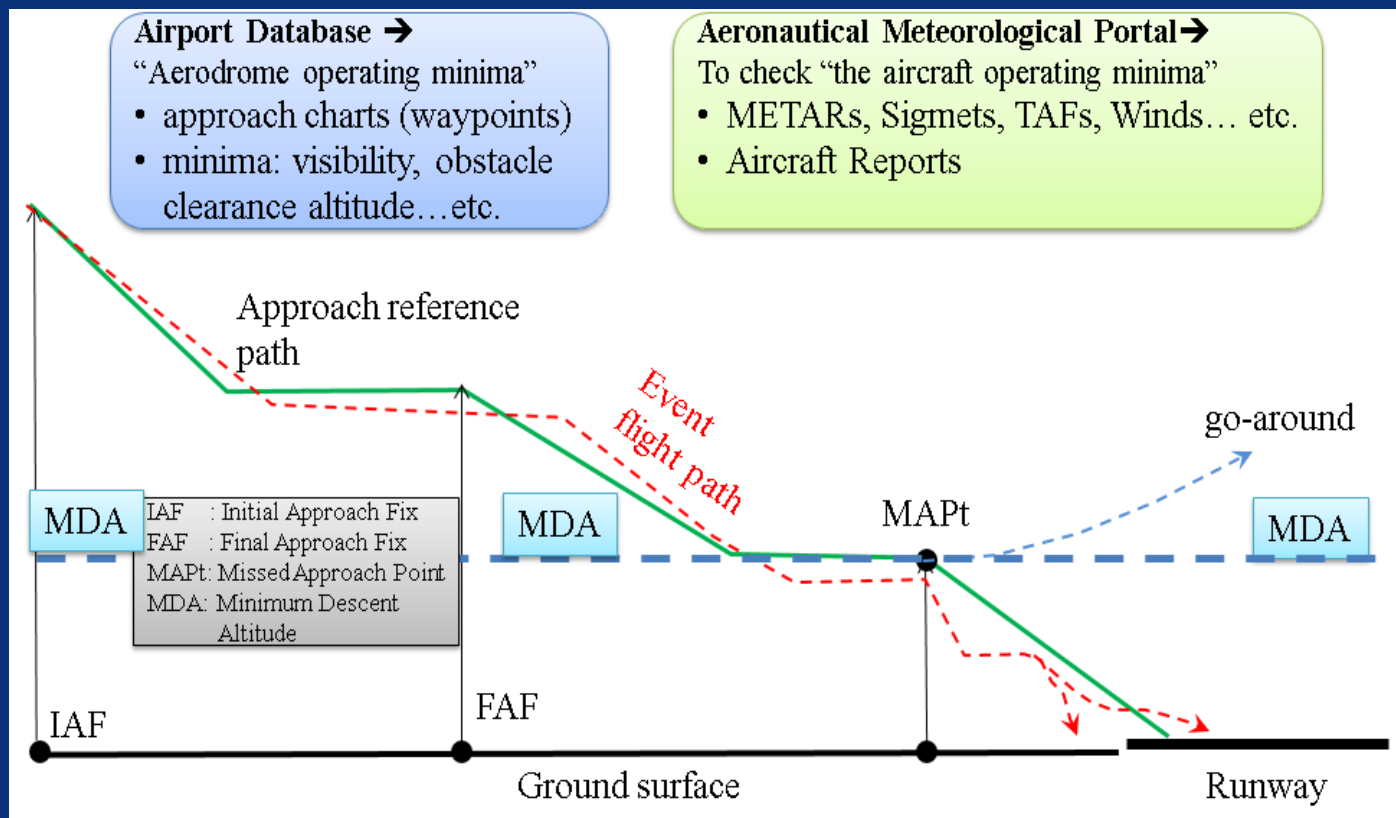
## 2. FOQA and SMS investigation



GE220 vs. GE222 Flight Path Profiles During Approach Operation

# Looking for Advanced FOQA Sys.

No current FOQA system can readily integrate all required data sources needed to identify violations of SOPs

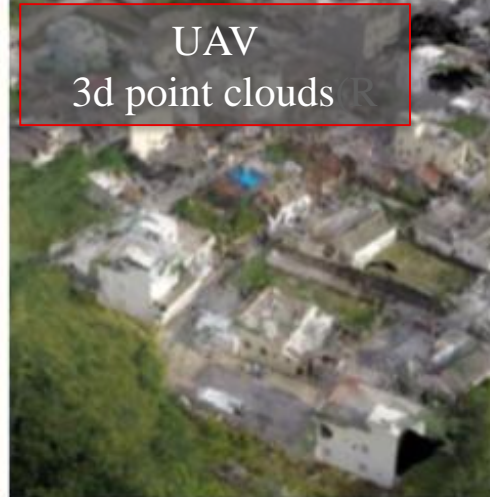




DTM only  
(R/S 1m)



DTM +DSM  
(R/S 8 cm)



UAV  
3d point clouds



# Lessons Learnt

## One SR to TNA:

Implement a more advanced FOQA program with **adequate training** for the **FOQA staff** ... can **more effectively identify** and **manage** the **operational safety risks** confronting flight operations.

## One SR to CAA:

Provide inspectors with detailed guidance on how to evaluate the effectiveness of an operator's safety management system, including:

- ◆ Risk assessment and management practices.
- ◆ ..
- ◆ **FOQA system and associated data analysis**
- ◆ Safety performance monitoring.



**Thank you for your attention**